

Jet Propulsion Laboratory Environmental Programs & Beyond

Sharon Harriman
RAP/P2 Workshop – March 20-22,
2007
Cocoa Beach, FL

The Jet Propulsion Laboratory

- 174 Acres
- ~5000 people
- Over 120 laboratories
- Hazardous Waste is generated from 55 different buildings, and over 200 different locations

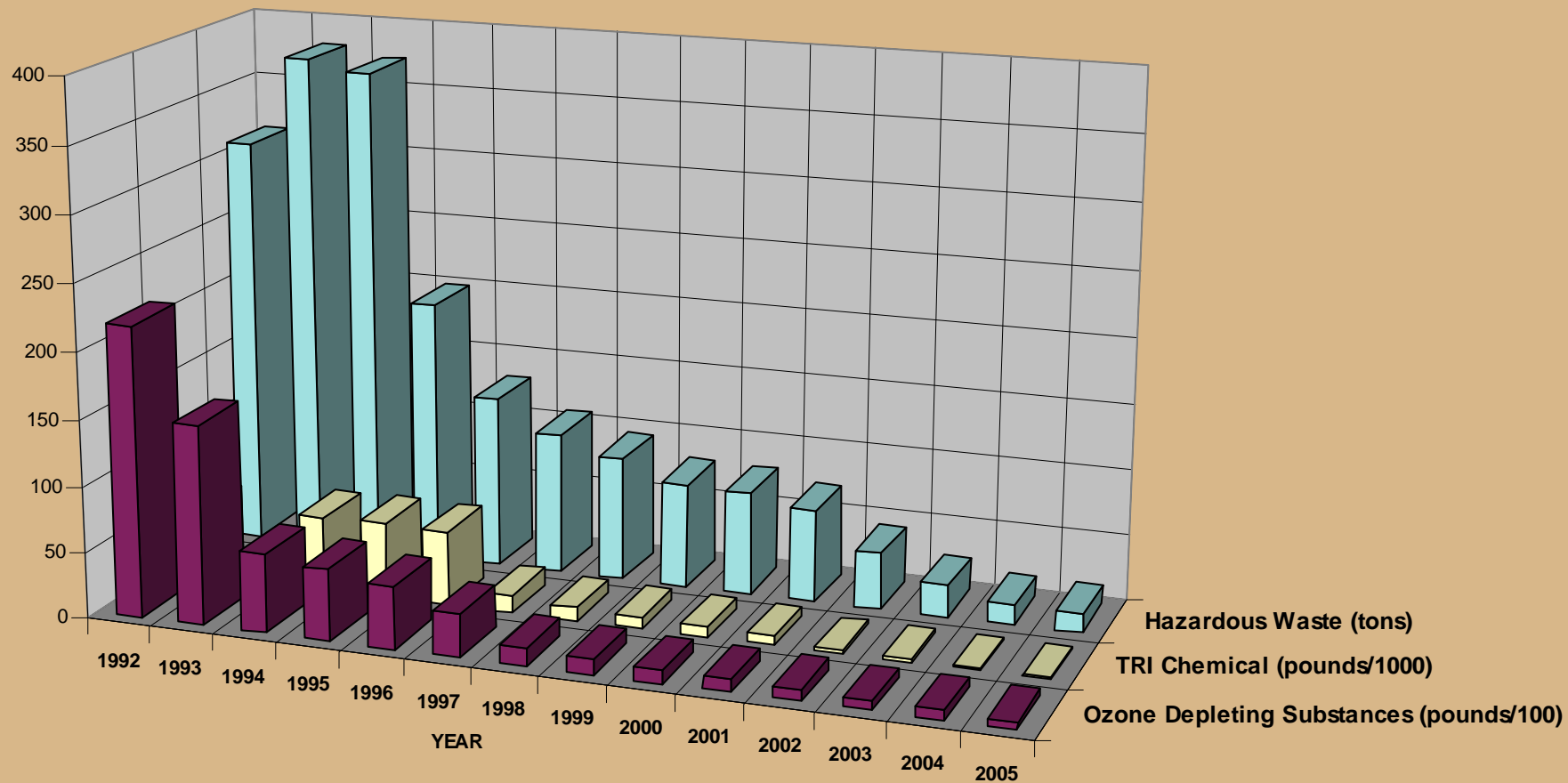


Environmental Programs History

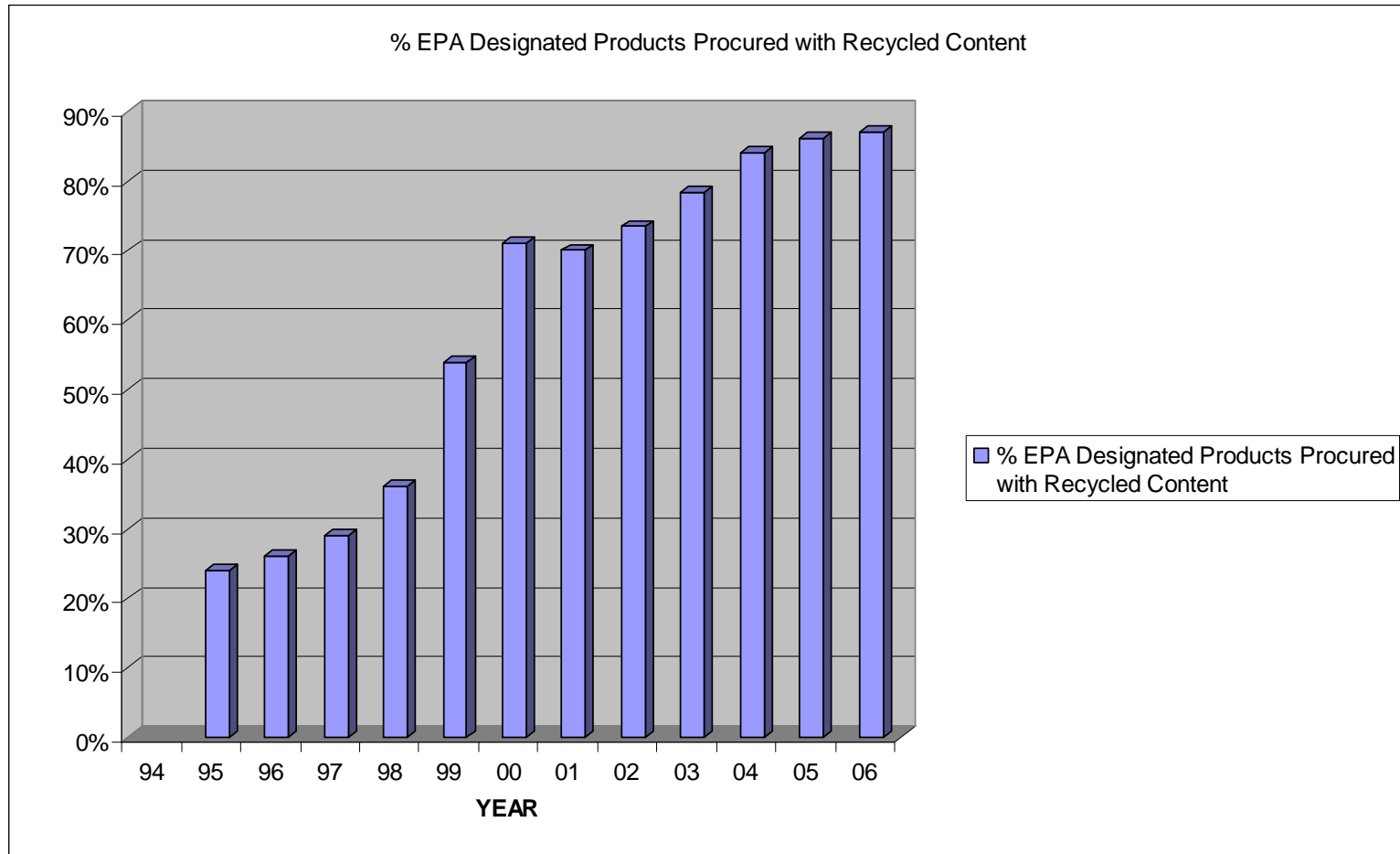
Since 1994 JPL has achieved:

- **94% reduction toxic substance emissions,**
- **99% reduction in toxic substance use,**
- **96% reduction in hazardous waste generation, and**
- **\$1,136,563 cost saving for JPL and NASA as a result of these efforts.**

JPL Pollution Prevention Progress



% EPA Designated Products Procured with Recycled Content



% Waste Diverted From Landfill

YEAR	2001	2002	2003	2004	2005	2006
SOLID WASTE (Tons)	935.67	729.38	763.50	408.67	803.51	886.26
RECYCLED WASTE (Tons)	1,786.27	865.52	876.66	1,350.03	1,106.19	2410.2195
% Diverted from Landfill (NASA goal in waste prevention is to achieve a waste diversion goal of 35% by the year 2010)	66%	54%	53%	77%	58%	73%

Mechanisms That Have Contributed To This Success

The JPL Environmental Affairs Program Office (EAPO) would like to highlight the mechanisms that we feel have contributed to this success including:

- NEPA analysis
- Weekly Facilities planning meeting
- Environmental components included in Facilities Design Standards
- EAPO works with Acquisition to include recycled content CPG items in Office Supply (expanding to include biobased)
- EMS/Work Agreement Dropdown lists for Environmental Issues
- Environmental Training programs
- EAPO has been involved in the planning stages for developing the electronic procurement & tracking systems, (Oracle system, JIT, P-Card, and now iProcurement)
- Chemical replacement teams
- Environmental Coordinators
- Environmental award program
- Pollution Prevention/Sustainability Principles Library
- Regulatory Community Outreach

The Early Years: Pollution Prevention Teams



JPL OZONE DEPLETING SUBSTANCE
REPLACEMENT COMMITTEE

TESTING ALTERNATIVES TO OZONE
DEPLETING SUBSTANCES



Beyond Compliance: Outreach and Educational Programs

- **Designed To Promote the vision for Pollution Prevention, sustainability, green thinking.....**
- **These are the programs that plant seeds for the future (like R&D in a company)**

The JPL Environmental Coordinators

- **JPL Environmental Affairs Office gets the word out on**
 - **Environmental Stewardship,**
 - **Pollution Prevention,**
 - **Environmental Regulations,**
 - **Green Acquisition,**
 - **Sustainability**
- via monthly meetings with
representatives from every division**

Environmental Coordinators



JPL Environmental Coordinators 2007



Dr. Charles K. Witham

“Environmental Stewardship”

Award:

- Given in recognition of an individual, group or organization’s role in preserving the environment and recognizing their ability to make a difference.
- These award recipients have exceeded environmental requirements and have taken a proactive approach to protecting the environment.

In memory of former JPLer, Charles K. (Chuck) Witham (1968- 2002)

The Charles Witham Environmental Stewardship Award is provided in memory of former JPLer Charles K. (Chuck) Witham (1968-2002), an avid cyclist and environmentalist.

Categories for nomination include:

- Affirmative Procurement
- Natural Resources/Habitat Conservation
- Air Quality
- Pollution Prevention
- Sustainability
- Environmental Education
- Outreach and Awareness
- Energy Conservation Project
- Program Support for Environmental Concerns
- Environmental Initiative
- Recycling
- Hazardous Waste Reduction
- Resource Conservation

- Since the inception of this award in 2001, 44 people have been recipients.
- The award is presented by a member of Senior Management and includes a certificate and poster.
- The award is also placed in the JPL electronic newspaper known as the Daily Planet and
- is on the Environmental Affairs Program Office Home Page

**Earth, the only place we have
found life (so far)...**



Take care of it.

***Recipients
of the
award
receive a
poster size
framed
photo***

***JPL Laboratory Director, Dr.
Charles Elachi presents the
Environmental Stewardship
award***

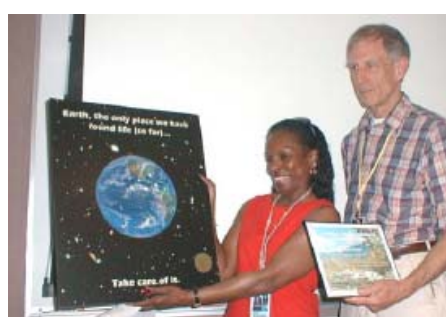


Examples of Awards



- **Darroll Houser**, Section 357. In Recognition of: Use of Coolant Recycler and Chem-Free Oil and Grease Remover in the Fabrication Shop which reduces JPL waste disposal costs and benefits the environment. [August 2001]
- **Fred Thibodeaux**, Section 272. In Recognition of: Proactive continuing conscientious efforts not only in hazardous waste clean-up and reporting to responders, but in immediate implementation of proper notification procedures after each and every spill. [August 2001]
- **Dr. Geoffrey James**, Section 324. In Recognition of: His outstanding contribution in ensuring that Division 32 personnel received required annual hazardous waste generator training. [August 2001]
- **Cheryl Wysocki**, Section 269. In Recognition of: A continuing proactive approach in implementing recycling and serving as a guide and example to other employees. [August 2002]
- Group Award to **Neil Bucknam**, Section 333, **Diane Garinger**, Section 263, **Robert Heimlich**, Section 252, **Paul MacNeal**, Section 352, **Gary Miller**, Section 956, **David Randall**, Section 387, and **Ertan Salik**, Section 335. In Recognition of: Being part of the Northridge Carpool which has been in service since January 1998. The membership has averaged 6 members and has saved over 330,000 commuting miles compared to single person commuters with resultant air pollution reduction. [August 2002]
- **Sharon Miller**, Section 333. In Recognition of: Continuing proactive efforts in implementing recycling in Section 333 and serving as a guide and example to encourage other employees in the section to recycle. [April 2002]
- Planetary Flight Projects Directorate (Deputy Director, **John McNamee**). In Recognition of: Successful voluntary environmental training of the largest percentage of employees in any Directorate of the Laboratory, well beyond expectations and exceeding that of their peer Directorates. [October 2002]





- **Sanford Bush**, Section 357. In Recognition of: *Far exceeding his job responsibilities in ensuring that all personnel in his facility dispose of hazardous waste correctly. This not only ensures that JPL maintains environmental compliance, but continues the Laboratory's role as an Environmental Steward.* Directorate. [October 2002]
- **Cynthia Compton**, Section 341. In Recognition of: *Exceeding her responsibilities in ensuring that recycling and reuse of materials was part of the decommissioning of the Galileo Test Bed and for consistently encouraging fellow employees to recycle and do their part as Environmental Stewards.* November 2002]
- **Veloris V. Pickett**, Section 400. In Recognition of: *Outstanding work in promoting the recycling of the entire fifth floor of B-264 which far exceeded her job responsibilities. She accomplished this using an efficient process which included encouraging all her fellow personnel to recycle. She serves as an example of an Environmental Steward.* [March 2003]
- **Timothy Munson**, Section 335 (second from left). In Recognition of: *His establishing two environmentally friendly processes for his entire research laboratory which far exceeded his job responsibility. These included setting up recycle bins for batteries and for soft-drink can recycling. He has provided an example to other members of the Laboratory and helped to ensure JPL's role as an Environmental Steward.* [March 2003]
- **Susan Merrill**, Section 319. In Recognition of: *Using a proactive approach to ensuring the health of the environment by bicycling or walking to work each day, encouraging others to care for the environment, participating in environmental activities both on and off the job through recycling, using environmentally sound products and reducing hazardous waste.* [April 2003]



- Group Award to, **Melanie Chau-Budiman**, Section 2223, **Christine Zuro**, Section 2621, **Debbie Lee**, Section 2624, **Linda Clifton**, Section 2621, and **Stephanie Sharp**, Section 2621. In Recognition of: *Their work on the JIT purchasing system which provides information on chemical purchases as well as purchases of office supplies with recycled content. This system not only helps to ensure regulatory compliance and meet NASA pollution prevention goals, but also reduces the amount of hazardous materials purchased and disposed of at the Laboratory. Their diligent efforts have helped to ensure JPL's role as an environmental steward.*
- **Mihail Petkov**, Section 5145. In Recognition of: *Using a proactive approach in getting only the one gram of mercury he needed through contacting the Environmental Affairs Program Office, rather than procuring the one pound minimum through the acquisition process. He was able to save the Laboratory the cost of disposal of excess mercury as hazardous waste, save the cost of the purchase of new mercury, and reduce potential hazardous material impact to the environment.* [April 2003]
- Awarded to Team from Section 352. Pictured from left to right: **Phil Garrison**, Division Manager for Division 35, **Jennifer Hill**, **Don Lewis**, **Paul Willis**, **Cheng-Hsien Hsieh**, **Mike Knopp**, **Gustav Forsberg** and **Sharon Langebeck** (Section Manager for 352). In recognition of: *Their work performed in the investigation and testing of alternative cleaning agents to ozone depleting chemicals for use on JPL flight projects and actively advocating their use throughout the JPL flight project hardware build cycle. They not only helped the environment but their efforts will promote the Laboratory's role as an environmental steward.* [October 2003]
- **James Montgomery**, Section 348. In recognition of: *James' active support of environmental awareness, education, and action for many years both on and off the Laboratory. This included research which resulted in the installation of an electric vehicle (EV) charging station in the East Lot making it possible for Laboratory personnel to drive their pollution free electric vehicles to JPL and home again.* [February 2004]





- **John Gregory**, Section 351. In recognition of: *John's taking over the responsibility for all the hazardous waste in his group rather than just his own. He maintains the waste containers and ensures proper disposal techniques are followed by the entire group thereby helping to enhance the Laboratory's role as an environmental steward.* [May 12, 2004]
- **Group Award, Ben Holt** (Section 3224), **Dr. Yi Chao** (Section 3244) and **Dr. Paul Digiacomo** (Section 3224). In recognition of: *The scientific work performed which leads the community in the use of NASA earth observing data (remote sensing and in-situ) to understand the impact of anthropogenic processes and urbanization (including pollution) on the ecosystem of southern California coastal zones.* [September 8, 2004]
- **Max Vozoff**, Section 335. In recognition of: *Taking a pro-active stand in getting the lights turned off on the energy board in the East Lot and removing the cigarette butts by Building 310 to prevent their being washed into the storm water drain. This far exceeded his job responsibilities and helped to ensure the Laboratory's role as an Environmental Steward.* [September 8, 2004]
- **Group Award, Gary Gray** (Section 280) and **Jose Coito** (Section 281), In recognition of: *Establishing a process for recycling the Laboratory's used JPL Knoll office modular product stock. In the first year 180 tons of used modular office product were prevented from entering landfills and represented a significant cost savings to JPL.* [September 8, 2004]
- **Chuck Jennings**, Section 352. In recognition of: *Chuck's exceeding his job responsibilities in assuring proper hazardous waste disposal in four laboratories in the Biotechnology and Planetary Protection Group which includes suggestions on how to best collect and minimize waste. This not only helps prevent pollution but continues to ensure the Laboratory role as an environmental steward.* [October 13, 2004]



- **Alan Young**, Section 512. In recognition of: *Alan's exceeding his normal job responsibilities through teaching and actual demonstrations of proper procedures for disposal of hazardous wastes during workmanship training courses taught to JPL employees, contractors and outside non-JPL contractors. By incorporating hazardous waste handling and disposal information into courseware, Alan exemplifies JPL's role as an Environmental Steward. [January 12, 2005]*
- **Barbara Kachachian**, Section 381. In recognition of: *Pro-actively working throughout the JIT system to facilitate the purchase of only the quantities needed rather than purchasing greater quantities than required to be purchased. This saves not only raw resources, but reduces transportation, disposal and storage costs. In addition, she collects items like foam packing and recycles them outside of JPL on her own time. She also recommends the purchase of recycled products to her customers when she knows they are available.*
- **Dr. William Patzert**, Section 324. In recognition of: *His extensive outreach to environmental agencies, independent groups, media and schools to promote awareness, and understanding the impact of oceans, climate and weather in environmental conditions, in the Southwestern U.S. His research is also being used to help formulate public environmental policy.*
- **Roger Klemm**, Section 316, (second from right). In recognition of: *The work performed in ensuring that coast live oak seedlings and sycamore seedlings growing at JPL in places where they would eventually have to be pulled, were replanted in safe areas around the Laboratory. Roger's perseverance in nurturing the seedlings and replanting them required a period of two years. Teaming with the Facilities, Maintenance and Operations Section, Landscaping Group from All Star, the Environmental Affairs Program Office and JPL volunteers the seedlings were safely replanted. Roger embodies the spirit of Environmental Stewardship. February 8, 2006]*

“Environmental Stewardship: A Walking Hands on Experience”,

- In addition to all of the required environmental training classes a unique environmental motivational training class is open to all personnel.
- It is called “Environmental Stewardship: A Walking Hands on Experience”,
- The two hour walking tour designed to help personnel experience JPL’s extended environment, which includes the Arroyo Seco and the Angeles National Forest.
- During this walking tour personnel learn about:
 - Biomimicry
 - Arroyo Seco Watershed
 - Wetlands preservation
 - Plants & Trees of the Arroyo Seco
 - Water wise landscaping
 - Use of compost
 - Use of Native Plants
 - Household Hazardous waste roundups

***Learning about the watershed, wetlands
conservation, the benefits of native plant
landscaping, etc***





- Informal class setting provides opportunity for interaction and promotes creative thinking







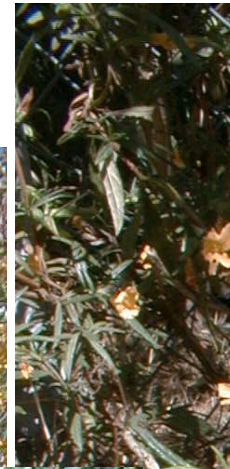








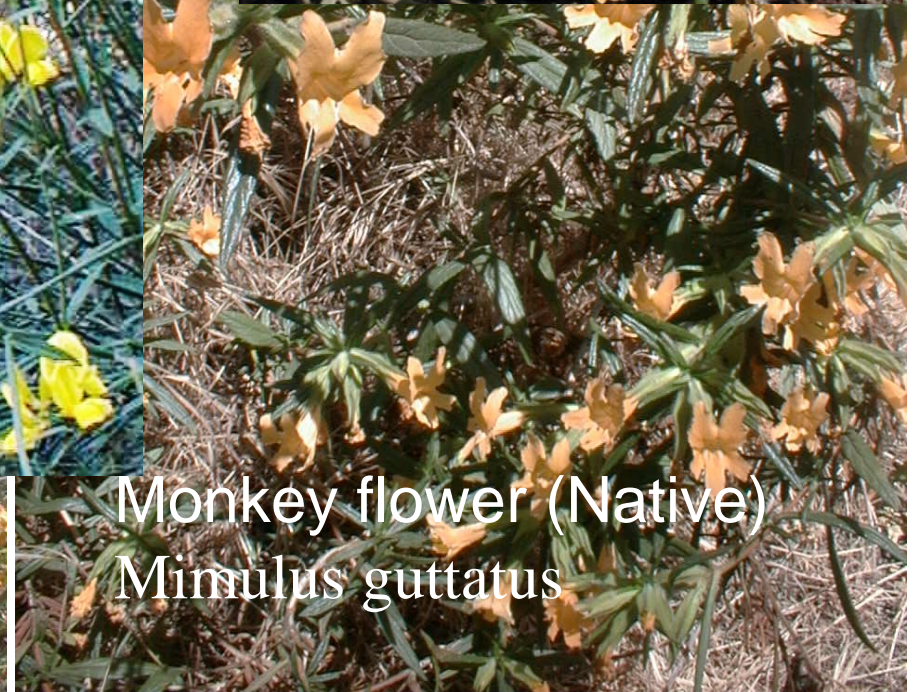
For more plant names see native California plant nursery website
<http://www.theodorepayne.org/gallery/glossary.htm>



Spanish Broom
(Invasive)



Deerweed
(Native)



Monkey flower (Native)
Mimulus guttatus

Various Arroyo Seco Wild Flowers seen on previous walks



Ceanothus

- ***One of the students from the Environmental Stewardship class organized an employee volunteer day for planting seedling oak and sycamore trees (which would have otherwise been destroyed due to their inappropriate locations). We planted 21 trees that day.***

JPLers Learn How to Plant Oak Seedlings



Planting of a seedling oak



Pollution Prevention/Sustainability Principles Library

- EAPO has a library available to all employees
- Library includes books on Sustainability Principles:
 - Biomimicry
 - The Natural Step for Business
 - Cradle to Cradle
 - Believing Cassandra
 - The Design of Everyday Things
 - Ishmael
 - A Village to Reinvent the World
 - Natural Capitalism
 - The Greening of Faith
 - Toward Global Planning of Sustainable Use of the Earth
 - Pollution Prevention Strategies and Technologies
 - Atmospheric Chemistry
 - Environmental Chemistry
 - Etc

JPL Outreach Also Extends to The Regulatory Community

- JPL participates in the Rule Planning sessions of South Coast Air Quality Management District (SCAQMD)
- JPL invited SCAQMD to a presentation at JPL reviewing all of the alternative precision cleaning products tested over the years.
- As a result SCAQMD wrote into their rules an R&D Laboratory exemption for use of VOCs under certain conditions.
- Lesson learned: JPL should have also invited certain community groups to the presentation.

ODS & VOC Replacements at JPL

Alternatives that have been tested and found acceptable for certain applications:

Acetone (VOC exempt)

Alconox-Citranox (Anionic liquid detergent)

Chem-Free (OzzyJuice SW-1, VOC < 5 g/L): Used in Machine shop parts washers.

Chemtronics Flux-Off CZ: For removal of RMA flux from circuit boards (flight hardware).

Oxsol 100 (VOC negligible): Used in Building 103 to remove urethane from spray guns.

Brulin 815 GD (VOC negligible): An aqueous cleaner currently used in Building 233 on flight parts.

Asahiklin (HCFC 225) AK-225T (VOC=1g/L, Phase out 2015)

3M Novec Engineered Fluid HFE-7200 & HFE-7100 (VOC exempt)

Du Pont Corporation Vertrel (HFC 43-10) X-DA (VOC=8g/L), **XF** (VOC exempt), **XP** (VOC 49.7 g/L, good until 1/1/2006)

QSol 300 (VOC negligible): Used by Facilities maintenance.

No clean solder fluxes, and lead free solders are currently being tested.

Opticlear (a TCE replacement): A citrus-based solvent with high VOC content, so it is still not an acceptable alternative for container use.

**Earth, the only place we have
found life (so far)...**



Take care of it.